



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2014-0420; Special Conditions No. 25-565-SC]

Special Conditions: Bombardier Aerospace, Models BD-500-1A10 and BD-500-1A11 Series Airplanes; Automatic Speed Protection for Design Dive Speed

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Bombardier Aerospace Models BD-500-1A10 and BD-500-1A11 series airplanes. These airplanes will have a novel or unusual design feature associated with a reduced margin between design cruising speed, V_C/M_C , and design diving speed, V_D/M_D , based on the incorporation of a high-speed protection system that limits nose down pilot authority at speeds above V_D/M_D . The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

EFFECTIVE DATE: [Insert date 30 days after date of publication in the Federal Register].

FOR FURTHER INFORMATION CONTACT: Mark Freisthler, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone 425-227-1119; facsimile 425-227-1232.

SUPPLEMENTARY INFORMATION:

Background

On December 10, 2009, Bombardier Aerospace applied for a type certificate for their new Models BD-500-1A10 and BD-500-1A11 series airplanes (hereafter collectively referred to as “CSeries”). The CSeries airplanes are swept-wing monoplanes with an aluminum alloy fuselage sized for 5-abreast seating. Passenger capacity is designated as 110 for the Model BD-500-1A10 and 125 for the Model BD-500-1A11. Maximum takeoff weight is 131,000 pounds for the Model BD-500-1A10 and 144,000 pounds for the Model BD-500-1A11.

Bombardier Aerospace proposes to reduce the margin between V_C/M_C and V_D/M_D required by Title 14, Code of Federal Regulations (14 CFR) 25.335(b) based on the incorporation of a high-speed protection system in the airplane’s flight control laws. The airplane is equipped with a high-speed protection system that limits nose down pilot authority at speeds above V_C/M_C and prevents the airplane from actually performing the maneuver required under § 25.335(b)(1).

These special conditions are necessary to address the proposed high-speed protection system. These special conditions identify various symmetric and non-symmetric maneuvers that will ensure that an appropriate design dive speed is established. Symmetric (pitching) maneuvers are specified in § 25.331, “Symmetric maneuvering conditions.” Non-symmetric maneuvers are specified in § 25.349, “Rolling conditions,” and § 25.351, “Yaw maneuver conditions.”

Type Certification Basis

Under the provisions of 14 CFR 21.17, Bombardier Aerospace must show that the CSeries airplane meets the applicable provisions of part 25 as amended by Amendments 25-1 through 25-129.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the CSeries airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, the special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the CSeries airplanes must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36, and the FAA must issue a finding of regulatory adequacy under section 611 of Public Law 92-574, the “Noise Control Act of 1972.”

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The CSeries airplanes will incorporate the following novel or unusual design feature: Bombardier Aerospace proposes to reduce the margin between V_C/M_C and V_D/M_D required by § 25.335(b) based on the incorporation of a high-speed protection system in the airplane’s flight control laws. The high-speed protection system limits nose down pilot authority at speeds above V_C/M_C and prevents the airplane from actually performing the maneuver required under § 25.335(b)(1).

Discussion

Section 25.335(b)(1) is an analytical envelope condition that was originally adopted in Part 4b of the Civil Air Regulations in order to provide an acceptable speed margin between design cruise speed and design dive speed. Flutter clearance design speeds and airframe design loads are impacted by the design dive speed. While the initial condition for the upset specified in the rule is 1g level flight, protection is afforded for other inadvertent overspeed conditions as well. Section 25.335(b)(1) is intended as a conservative enveloping condition for potential overspeed conditions, including non-symmetric ones. To establish that potential overspeed conditions are enveloped, Bombardier Aerospace needs to demonstrate that any reduced speed margin, based on the high-speed protection system, will not be exceeded in inadvertent or gust-induced upsets resulting in initiation of the dive from non-symmetric attitudes; or that the airplane is protected by the flight control laws from getting into non-symmetric upset conditions. Bombardier Aerospace needs to conduct a demonstration that includes a comprehensive set of conditions, as described below.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Discussion of Comments

Notice of Proposed Special Conditions No. 25-14-06-SC for the Bombardier Aerospace CSeries airplanes was published in the Federal Register on July 2, 2014 (79 FR 37674). No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Model BD-500-1A10 and BD-500-1A11 series airplanes. Should Bombardier Aerospace apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on two model series of airplanes. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Bombardier Aerospace Models BD-500-1A10 and BD-500-1A11 (C-Series) airplanes.

Automatic Speed Protection for Design Dive Speed

1. In lieu of compliance with § 25.335(b)(1), if the flight control system includes functions that act automatically to initiate recovery before the end of the 20-second period specified in § 25.335(b)(1), V_D/M_D must be determined from the greater of the speeds resulting from conditions (a) and (b) below. The speed increase occurring in these maneuvers may be calculated, if reliable or conservative aerodynamic data are used.

(a) From an initial condition of stabilized flight at V_C/M_C , the airplane is upset so as to take up a new flight path 7.5 degrees below the initial path. Control application, up to full authority, is made to try and maintain this new flight path. Twenty seconds after initiating the upset, manual recovery is made at a load factor of 1.5g (0.5g acceleration increment), or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. Power, as specified in § 25.175(b)(1)(iv), is assumed until recovery is initiated, at which time power reduction and the use of pilot-controlled drag devices may be used.

(b) From a speed below V_C/M_C , with power to maintain stabilized level flight at this speed, the airplane is upset so as to accelerate through V_C/M_C at a flight path 15 degrees below the initial path (or at the steepest nose down attitude that the system will permit with full control authority if less than 15 degrees). The pilot's controls may be in the neutral position after reaching V_C/M_C and before recovery is initiated. Recovery may be initiated three seconds after operation of the high-speed warning system by application of a load of 1.5g (0.5g acceleration increment), or such greater load factor that is automatically applied by the system with the pilot's pitch control neutral. Power may be reduced simultaneously. All other means of decelerating the airplane, the use of which is authorized up to the highest speed reached in the maneuver, may be used. The interval between successive pilot actions must not be less than one second.

2. The applicant must also demonstrate that the speed margin, established as above, will not be exceeded in inadvertent or gust-induced upsets resulting in initiation of the dive from non-symmetric attitudes, unless the airplane is protected by the flight control laws from getting into non-symmetric upset conditions. The upset maneuvers described in Advisory Circular 25-7C, *Flight Test Guide for Certification of Transport Category Airplanes*, section 8, paragraph 32, sub-paragraphs c(3)(a) and (b) may be used to comply with this requirement.

3. The probability of any failure of the high-speed protection system that would result in an airspeed exceeding those determined by paragraphs 1 and 2 must be less than 10^{-5} per flight hour.
4. Failures of the system must be annunciated to the pilots. Flight manual instructions must be provided that reduce the maximum operating speeds, V_{MO}/M_{MO} . With the system failed, the operating speed must be reduced to a value that maintains a speed margin between V_{MO}/M_{MO} and V_D/M_D that is consistent with showing compliance with § 25.335(b) without the benefit of the high-speed protection system.
5. Dispatch of the airplane with the high-speed protection system inoperative could be allowed under an approved minimum equipment list that would require flight manual instructions to indicate reduced maximum operating speeds, as described in paragraph (4). In addition, the flight deck display of the reduced operating speeds, as well as the overspeed warning for exceeding those speeds, must be equivalent to that of the normal airplane with the high-speed protection system operative. Also, it must be shown that no additional hazards are introduced with the high-speed protection system inoperative.

Issued in Renton, Washington, on September 3, 2014.

Michael Kaszycki
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service

[FR Doc. 2014-21787 Filed 09/11/2014 at 8:45 am; Publication Date: 09/12/2014]